Low Earth Orbiting LEO

Low Earth Orbit (LEO) satellites are in an orbit typically around 350 to 1400 km above the Earth's surface - far below geostationary (GEO) satellite orbit. Orbits lower than this are not stable, and will decay rapidly because of atmospheric drag.

LEOs are considered to have no delay. A LEO satellite orbits a local horizon in approximately 20 minutes. The orbiting periods range anywhere from 90 minutes to two hours, at speeds of in excess of 17,000 mph. A LEO system must use a satellite-to-satellite hand-off to maintain communications. Once one satellite moves out of the area a new one will move in.

There are two types of LEOs - little LEOs and Big LEOs.

BIG LEO

Big LEO's are used for technology devices such as high-speed, high-bandwidth data communications, and video conferencing. They carry voice and high-speed data services. They are aimed at data communications and real-time voice into hand-held devices. Big LEO can also offer global services, which are also subject to regulatory requirements. There have been five Big LEO already licensed. The five Big LEO are Iridium, Global Star, Odyssey, ICO Global Communications, Teledesic

Little LEO

Little Leos are required to offer non-voice services for example vehicle tracking, environmental monitoring and two-way data communication. A little LEO is a constellation of small, low-earth orbiting satellites, used for short, narrowband communications. Little LEOs are a small, low-cost, class of satellites. LEOs are to use a spectrum allocated between 137-138MHz and 400.15-401MHz for space-to-Earth downlinks, and 148-149.9MHz for Earth-to-space uplinks. Little LEO proposals include ORBCOMM, Starsys, and VITA.

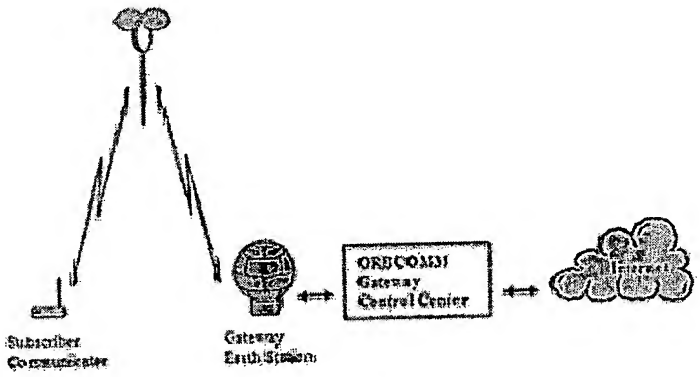
ORBCOMM

Stevens is ORBCOMM's value added reseller (VAR) or a.k.a. Gateway Control Center (GCC) for environmental monitoring applications.

The ORBCOMM System uses low-Earth orbit (LEO) satellites to provide cost-effective tracking, monitoring and messaging capabilities to and from anywhere in the world. Similar to two-way paging or e-mail, the system is capable of sending and receiving two-way alphanumeric packets of data. The system's space segment consists of 30 operational satellites distributed around the globe in a low Earth orbit (LEO) constellation.

Subscriber communicators (SCs) pass data messages to and from Gateway Control Centers (GCC) over ORBCOMM satellites and GCCs route messages to users over the

Internet, e-mail or dedicated delivery lines. Stevens Water Monitoring Systems, Inc. operates as a GCC for the ORBCOMM system. Messaging traffic flows between the satellites and a GCC through tracking stations called Gateway Earth Stations (GESs) that connect with satellites as they pass overhead. When a satellite is not connected to a GES, it can still support SC messaging in a store-and-forward mode.



There are currently 12 GES facilities on four continents, maintaining satellite-GCC connectivity and near-real-time messaging capabilities for users throughout much of the world. Message traffic passed down to the GESs is directed over dedicated lines to GCCs for processing and delivery to end users via e-mail, dedicated delivery lines or the Internet.

Advantages to LEO Satellite Telemetry

- Global applications in developing a remote environmental monitoring communication system.
- Two-way communications
- Easy to set up and low maintenance costs
- Low profile, non-directional whip heliz antenna
- Easy access to data
- No FCC or other governmental agency requirements for data transmission
- Coverage in very remote areas
- Data is proprietary
- Stevens is able to quickly detect any problems with transmission of data
- Systems verifies that data has been transmitted
- Event notification on line, by pager, etc.
- Lower power transceivers compared to GEO transmitters.
- LEO Transceivers hardware system is lower in cost than a GEO transmitter system.

- Monthly service fee which could be expensive with frequent transmissions of data.
- Power outage at GCC would shut down the communication server, which could delay transmission of data to end user until power is restores. However, no data is lost.

- LEO satellites have a much shorter life span (five to eight years) than GEO satellites.